

## **REMARKS**

### **Request for an Examiner's Interview**

The Applicants' Attorney hereby requests an interview with the Examiner in order to expedite the prosecution of this case.

### **Pending Claims**

Claims 1-44 are pending in the present application. The Applicant respectfully requests reconsideration of the pending claims in light of the arguments presented in this Response.

### **Allowable Subject Matter**

The Applicants acknowledge with appreciation the statements on Page 15 of the Office Action dated September 6, 2006 that claims 12-16, 22-24, 26-27, 32, 36-38 and 40-43 are allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### **Rejections under 35 U.S.C. §102(b) As Being Anticipated by Shoval**

Claims 1, 10-11, 17-18, 28-29, and 39 are rejected under 35 U.S.C. §102(b) as being anticipated by Shoval. The Office Action dated September 6, 2006 states on page 2 that the arguments filed in the Amendment and Response for RCE dated July 28, 2006 were not persuasive. In particular, the Office Action states that Shoval teaches converting to the fundamental mode and refers to Shoval column 2, lines 66 to column 3, line 15; column 8, lines 49-64; and column 9, line 20-column 11, line 50. As described below, the Applicants believe that the Examiner is taking statements in Shoval out of context when concluding that every

element of independent claims 1 and 28 is described, either expressly or inherently by Shoval.

To anticipate a claim under 35 U.S.C. §102, a single reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught by the reference must be inherently present in the reference. Thus, a claim is anticipated by a reference only if each and every element of the claim is described, either expressly or inherently, in a single prior art reference.

Independent Claims 1 and 28 and Dependent Claims 10, 11, 17-18, and 29

The Applicants hereby traverse the rejection under 35 U.S.C. §102. Independent claims 1 and 28 both recite a first spatial mode converter that converts the optical signal to a plurality of modes including a fundamental mode with information content. Shoval does indeed teach converting a signal to the fundamental mode as stated in the Response to Arguments section of the Office Action dated March 3, 2006. However, the Applicants believe that Shoval does not teach converting a signal to a fundamental mode as claimed in the present claims. The following paragraphs refer to the sections indicated in page 2 of the Office Action dated March 3, 2006, which according to the Examiner, support the argument that Shoval teaches converting to the fundamental mode as claimed in the present application.

The first section indicated in page 2 of the Office Action dated March 3, 2006, Shoval column 2, lines 66 to column 3, line 15 does state that, in one embodiment, the low order spatial mode is the fundamental spatial mode. However, this statement must be read in the proper context. The statement that the spatial mode transformer transforms the optical energy of the optical signal from a low order spatial mode (which, in one embodiment, is the fundamental mode) to a high order spatial mode is referring to the first spatial mode transformer 126 shown in

Shoval FIG. 13. The Applicants submit that this statement does not teach or suggest a first spatial mode converter that converts the optical signal to a plurality of modes including a fundamental mode with information content.

In fact, the Applicants believe that Shoval column 2, lines 66 to column 3, line 15 teaches a spatial mode converter that performs a function that is very different from the function performed by the spatial mode converters claimed in independent claims 1 and 28. Shoval column 2, lines 66 to column 3, line 15 teaches that the first spatial mode transformer transforms the optical energy from a low order mode (which, in one embodiment, is the fundamental mode) to a higher order mode. The Applicants believe that in order for the transmission system described in Shoval to be efficient enough for practical use, the first spatial mode converter 126 converts virtually all of the fundamental mode to higher order modes and that essentially no fundamental mode passes through the first spatial mode converter 126. The Applicants submit that there is no text in this section of Shoval which indicates that the fundamental mode passes through the first spatial mode transformer in the signal path as recited in independent claim 1.

The second section indicated in page 2 of the Office Action dated March 3, 2006, Shoval column 8, lines 49-64 and the previous paragraph, Shoval, Column 8, lines 39-48 are describing what Shoval considers to be his invention. In these sections, Shoval describes transforming all lower order spatial mode energy to a high order spatial mode (using the first spatial mode transformer 126), and transforming the high order spatial mode of the signal into a lower order or fundamental spatial mode (using the second spatial mode transformer 130). According to Shoval, these transformations have the effect of filtering out noise when the transformed signal is subsequently carried through a single mode fiber (SMF). In particular, according to Shoval, these transformations reduce noise because the lower order spatial mode is transformed into a

higher order spatial mode that is not supported by the subsequent (down stream) single mode fiber 112.

Shoval does state in column 8, lines 49-64 that the high order spatial mode ( $LP_{02}$ ) of the signal is transformed into a lower order or the fundamental spatial mode ( $LP_{01}$ ). Referring to Shoval FIG. 13 and the associated text beginning in Shoval Column 9, line 20, the Applicants believe that this statement is clearly referring to the second spatial mode transformer 130, which is downstream from the first spatial mode converter 126. The Applicants submit that there is no text in this section of Shoval which indicates that the fundamental mode passes through the first spatial mode transformer in the signal path as claimed in independent claim 1.

The third section indicated in page 2 of the Office Action dated March 3, 2006, Shoval column 9, line 20 to column 11, line 50, describes the details of how the first spatial mode transformer 126 and the second spatial mode transformer 130 operate. Referring to FIG. 13 and the text beginning on column 9, line 20, Shoval states that the first spatial mode transformer 126 converts substantially all of the light to a single higher order spatial mode and that the output of the first spatial mode transformer contains a signal in the  $LP_{02}$  spatial mode and noise. The applicant believes that there is essentially no portion of the fundamental mode transmitted through the first spatial mode transformer 126.

Thus, the Applicants believe that any teachings in Shoval of converting to the fundamental mode are referring to the second or down stream spatial mode transformer 130 and not to the first spatial mode converter 126. Therefore, the Applicants submit that Shoval does not describe at least the claimed first spatial mode converter in independent claims 1 and 28. The Applicants believe that arguments made in the Office Actions that Shoval teaches a first or

upstream spatial mode converter as claimed in independent claims 1 and 28 are taking statements made in Shoval out of context. Any statements made in Shoval describing converting to the fundamental mode are referring to the second or upstream spatial mode converter.

In addition, the Office Action states on page 2 that Shoval does not equate the fundamental mode to noise, but rather teaches that the conversion helps eliminate noise, which implies information content. The Office Action also refers to Shoval column 2, lines 66 to column 3, line 15; column 8, lines 49-64; and column 9, line 20-column 11, line 50 to support his statement. The Applicants believe that the Examiner is taking both our previous arguments and the description in Shoval out of context to conclude that every element of independent claims 1 and 28 is described, either expressly or inherently by Shoval. The Applicants are not arguing that Shoval is somehow equating the fundamental signal to noise. Instead, the Applicants are arguing that Shoval does not teach the first or upstream spatial mode converter as claimed in independent claims 1 and 18 that converts an optical signal to a plurality of modes including the fundamental mode with information content.

Therefore, the Applicants submit that independent claims 1 and 28 are allowable over Shoval because Shoval does not teach the invention recited in claims 1 and 28 with the first spatial mode converter that converts the optical signal to a plurality of modes including a fundamental mode with information content. In addition, the Applicants submit that dependent claims 2-19 and dependent claims 29-43 are allowable as depending from an allowable base claim.

**Rejections under 35 U.S.C. §103(a)**

Claims 3-9, 20-21, 34-35 and 44 are rejected under 35 U.S.C. §103(a) as being unpatentable over Shoal in view of Cunningham.

To be unpatentable under 35 U.S.C. §103(a), the differences between the subject matter sought to be patented and the prior art must be such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the reference teachings. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.

**Independent Claim 20 and Dependent Claims 21-27**

Independent claim 20 recites the steps of spatial mode converting an optical signal to a plurality of modes including a fundamental mode with information content and then launching the spatially mode converted optical signal having the plurality of modes into a multi-mode optical fiber. As described above Shoal does not teach or suggest these steps. Similarly, Cunningham does not teach or suggest these steps. Therefore, the Applicants submit that independent claim 20 is allowable over Shoal and Cunningham. In addition, the Applicants submit that dependent claims 21-27 are allowable as depending from an allowable base claim.

**Independent Claim 44**

Similarly, independent claim 44 recites a means for spatial mode converting an optical signal to a plurality of modes including a fundamental mode with information content and a

means for launching the spatially mode converted optical signal having the plurality of modes into a multi-mode optical fiber. As described above Shoval does not teach or suggest these elements. Similarly, Cunningham does not teach or suggest these elements. Therefore, the Applicants submit that independent claim 44 is allowable over Shoval and Cunningham.

### **CONCLUSION**

Claims 1-44 are pending in the present application. The Applicant respectfully requests reconsideration of the pending claims in light of the arguments presented in this Amendment and Response.

If, in the Examiner's opinion, a telephonic interview would expedite prosecution of the present application, the undersigned attorney would welcome the opportunity to discuss any outstanding issues, and to work with the Examiner toward placing the application in condition for allowance.

Respectfully submitted,

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